SLOW CONTINUOUS ULTRAFILTRATION (SCUF) - THE SAFE AND EFFICIENT TREATMENT FOR PATIENTS WITH CARDIAC FAILURE AND FLUID OVERLOAD

S S Wei, W T Lee, K T Woo

ABSTRACT

Slow Continuous Ultrafiltration (SCUF) was first used in 1980 as an alternative mode of fluid removal for patients with oliguric acute renal dysfunction from whatever causes. The advantage of this treatment is that haemodynamic parameters remain stable in the presence of significant removal of fluid. We are describing our experience in 7 patients [age: 57 ±9 years; 4 male, 3 female] with cardiac failure and fluid overload who had undergone 8 sessions of SCUF. All of them had renal impairment and were resistant to diuretics. Blood lines were attached to a Kawasumi Renak-E dialyser(Cuprophane membrane) in series using Gambro AK10 dialysis blood pump. The following parameters were monitored: Blood pump(Qb):175 ±26 ml/min, time(T): 393 ±49 minutes. Venous pressure averaged 55 ±24 mmHg. We achieved ultrafiltration of 2,189 ±699 ml/session or 5.5 ± 1.7 ml/hr. There was no significant change in blood pressure [systolic pre: 143 ± 14, post:136 ± 13 mmHg, not significant;diastolic pre: 87 ±10, post: 83 + 10 mmHg, not significant and pulse rate[pre: 87 ±9 vs post: 84 ±2 per minute, not significant. Heparin dosage averaged 275 ±26 IU/hr during the SCUF.

We conclude that SCUF is beneficial to diuretic resistant patients with cardiac failure and fluid overload in whom dialysis treatment is not required.

Keywords: *continuous ultrafiltration, fluid overload, blood pressure.*

SINGAPORE MED J 1995; Vol 36: 276-277

INTRODUCTION

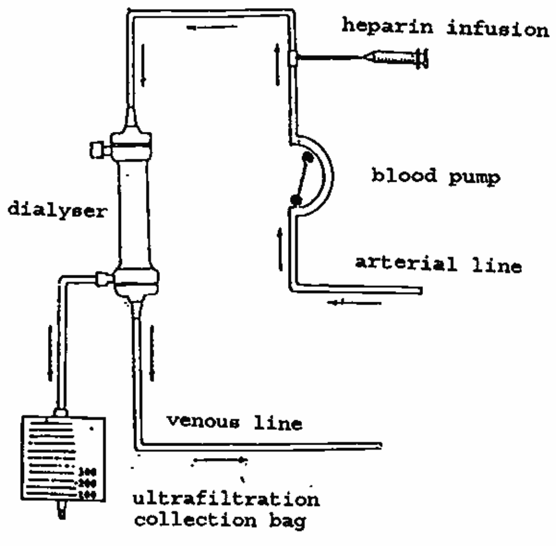
Fluid control remains a problem in patients with cardiac failure or fluid overload who are not responding to standard diuretic therapy. The use of larger volumes of fluid for hyperalimentation or as a vehicle for pressor agents or antibiotics may be compromised in these patients as a result of poor urine output. A higher dose of diuretics is commonly used, but the result is not always satisfactory. We describe our experience of using Slow Continuous Ultrafiltration (SCUF) to control fluid balance in 7 diuretic resistant patients with cardiac failure and fluid overload. These patients did not require dialysis treatment.

MATERIALS AND METHODS

Seven patients (4 male, 3 female) with cardiac failure and fluid overload in Singapore General Hospital were identified for the study. Mean age was 57 ± 9 years (range from 38 - 63 years). They had undergone 8 sessions of SCUF. All of them had renal failure with creatinine ranging from 500 to 900 umol/l and were resistant to diuretic treatment. As for the underlying aetiology of renal impairment, two had diabetic nephropathy, four had chronic glomerulonephritis and in one the aetiology was unknown.

Vascular access was established with a double-lumen catheter placed in the subclavian vein. Haemodialysis blood lines were attached to the arterial and venous end of the catheter and a Kawasumi Renak-E dialyser (Cuprophane membrane) was placed in series. The Gambro AK10 dialysis blood pump was used to drive the blood through the circuit. Heparin was infused continuously at 250 U per hour into the arterial line using heparin infusion pump. The ultrafiltrate was collected in a standard urine collection apparatus. The rate of ultrafiltrate removal was determined by the pump speed and the desired rate of fluid removal in 6 to 8 hours. The SCUF circuit is shown in Fig 1.

Fig 1 – Circuit of Slow Continuous Ultrafiltration(SCUF)



Department of Renal Medicine
Singapore General Hospital
Outram Road
Singapore 0316

S S Wei, MBBS, M Med (Int Med), FAMS
Consultant

W T Lee, MBBS, FRACP
Senior Registrar

K T Woo, MBBS, M Med (Int Med), FRACP
Senior Consultant & Head

Correspondence to : Dr S S Wei
#13-05 Mt Elizabeth Medical Centre
3 Mt Elizabeth
Singapore 0922

STATISTICAL ANALYSIS

Data were expressed as mean ± standard deviation. Statistical evaluation was carried out using out two-tailed Student's t-tests for paired data. A "p" level of 0.05 established significance.

RESULTS

Blood pump averaged 175 ± 26 ml/min. Continuous ultrafiltration was maintained for an average of 393 ± 49 minutes at a mean ultrafiltration rate of 5.5 ± 1.7 ml/hr or an ultrafiltration of 2,189 ± 699 ml/session. Venous pressure averaged 55 ± 24 mmHg and there was no significant change in blood pressure [systolic pre:143 ± 14, post:136 ± 13 mmHg, not significant; diastolic pre: 87 ± 10, post:83 + 10 mmHg, not significant]. Pulse rate was unchanged [pre: 87 ± 9 vs post: 84 ± 2 per minute, not significant]. Heparin dosage averaged 275 ± 26 IU/hr during the SCUF. No complications associated with the procedure were noted. All patients did well after the procedure and only one patient required a repeat SCUF.

DISCUSSION

This study showed that SCUF is beneficial to diuretic resistant patients with cardiac failure and fluid overload in whom dialysis treatment is not required. Bergstorm et al noted that the removal of a significant volume of fluid using a dialyser was not accompanied by hypotensive episodes in patients unable to tolerate an equal volume loss during standard dialysis[1]. Subsequently, Paganini et al modified this form of treatment for patients with oliguric or anuric acute renal failure requiring fluid removal and termed it SCUF[2]. Haemodynamic stability of SCUF is thought to be secondary to the active participation of the venous system in maintaining both pre-load and central cardiopulmonary volumes despite reduction of total peripheral resistance and total water[3,4]. The superior haemodynamic stability of slow continuous ultrafiltration can be considered as an important adjunctive form of therapy in cases with overhydration or cardiac failure. SCUF enabled us to mobilise excess volume and continue delivery of therapeutic agents in overhydrated patients. Establishing a negative fluid balance and allowing for the use of ultrafiltrate as a base of electrolyte determinations has further enhanced the therapeutic validity of SCUF as a dewatering technique.

Fluid balance has been one of the primary goals in the treatment of patients with cardiac and renal failure. Patients presenting with severe cardiac failure, especially those in intensive care units, often receive a large volume of fluid in the form of pressor agents, antibiotics or hyperalimentation. This volume imbalance leads to fluid excess states or sub-optimal delivery of therapy, for example inadequate caloric delivery secondary to imposed fluid restriction.

ACKNOWLEDGEMENTS

The authors wish to thank the Dialysis and Intensive Care Staff for their excellent help with this procedure.

References

1. Bergstrom J, Asaba A, Furst P, Qules R. Dialysis ultrafiltration and blood pressure. Proc Eur Dial Transplant Assoc 1976; 13:293-6.
2. Paganini EP, O'Hara P, Nakamoto S. Slow continuous ultrafiltration in hemodialysis resistant oliguric acute renal failure patients. Trans Am Soc Artif Intern Organs 1984; 30:173-8.
3. Chen WT, Chaignon M, Omvik P, Tarazi RC, Bravo EL, Nakamoto S. Hemodynamic studies in chronic hemodialysis patients with hemofiltration/ultrafiltration. Trans Am Soc Artif Intern Organs 1978; 24:682-7.
4. Paganini EP, Fouad F, Tarazi RC, Bravo EL, Nakamoto S. Hemodynamics of isolated ultrafiltration in chronic hemodialysis patients. Trans Am Soc Artif Intern Organs 1979; 25:422-6.